

a slight variation of pressure, which by means of the pressure regulator will cause the high- and low-pressure valves to move in opposite directions, i.e. low pressure to shut and high pressure to open or vice versa, thus maintaining a practically constant pressure without the speed governor being affected.

CHAPTER XII

Marine Turbines

It was recognized very early in the development of the steam turbine that it would be a suitable prime mover for the driving of the propellers of steamships. The principal difficulties to be overcome were connected with the fact that propellers and turbines have their highest efficiency at widely different rates of revolution.

The adoption of the turbine drive for ship propulsion was a revolutionary departure from previous marine practice.

Sir Charles Parsons exercised to the full his genius for investigation and invention in endeavouring to solve some of the problems involved, but it was some long time before his experiments eventually came to fruition in the *Turbinia*, the first turbine-engined ship. This was of torpedo-boat type, and had three turbines, each on a separate shaft, and capable of developing a total of 2000 equivalent indicated horse-power.

Before satisfactory arrangements were evolved numerous different designs of propellers had to be tried. At first several were placed on each shaft, but experience narrowed the solution down until it was found that single propellers on each shaft were preferable, and such is the present-day practice.

Since the evolution of the *Turbinia* the application of the steam-turbine has made such rapid growth that at the present day more than 16½ million horse-power of direct-coupled units and about 18½ million horse-power of geared units have been made in this country alone and are in use in marine work.

After the *Turbinia*, two turbine-driven destroyers, the *Viper* and the *Cobra*, were commenced in 1898.

Both the *Viper* and the *Cobra* achieved remarkable

results, but unfortunately both were lost, though the loss was in neither case due to the turbine installation.

Although it was recognized that the turbine drive was successful under the conditions of naval service, the mercantile marine shipowners were not immediately convinced that it would be so if applied in the merchant service. In the navy efficiency and reliability are the first considerations, whilst cost of installation and running expense are subordinate.

In the earlier vessels the efficiency of the turbine when running at low loads was not good, and shipowners were not inclined to take the results